PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	FOR FURTHER ACTION See Form PCT/IPEA/416	
68989-73665		
International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/SE 2004/000034	14.01.2004	14.01.2003
International Patent Classification (IPC) or national classification and IPC		
C03C3/32, C03C3/253, C03C3/14, C03C4/20		
Applicant		
Diamorph AB et al		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 4 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
   a. ☒ *(sent to the applicant and to the International Bureau)* a total of 3 sheets, as follows:
      ☒ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
      ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
   b. ☐ *(sent to the International Bureau only)* a total of (indicate type and number of electronic carrier(s)) _____, containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).
4. This report contains indications relating to the following items:
   - ☒ Box No. I Basis of the report
   - ☐ Box No. II Priority
   - ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - ☐ Box No. IV Lack of unity of invention
   - ☒ Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - ☐ Box No. VI Certain documents cited
   - ☒ Box No. VII Certain defects in the international application
   - ☐ Box No. VIII Certain observations on the international application

Date of submission of the demand	Date of completion of this report
11.08.2004	27.04.2005
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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/SE 2004/000034

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ This report is based on a translation from the original language into the following language _____, which is the language of a translation furnished for the purposes of:

☐ international search (under Rules 12.3 and 23.1(b))
☐ publication of the international application (under Rule 12.4)
☐ international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the **elements** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report):*

☐ the international application as originally filed/furnished

☒ the description:

pages 1-26 as originally filed/furnished
pages* _____ received by this Authority on _____
pages* _____ received by this Authority on _____

☒ the claims:

pages _____ as originally filed/furnished
pages* _____ as amended (together with any statement) under Article 19
pages* 1-3 received by this Authority on 21.04.2005
pages* _____ received by this Authority on _____

☐ the drawings:

pages _____ as originally filed/furnished
pages* _____ received by this Authority on _____
pages* _____ received by this Authority on _____

☐ a sequence listing and/or any related table(s) – see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:

☐ the description, pages _____
☐ the claims, Nos. _____
☐ the drawings, sheets/figs _____
☐ the sequence listing *(specify)*: _____
☐ any table(s) related to the sequence listing *(specify)*: _____

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

☐ the description, pages _____
☐ the claims, Nos. _____
☐ the drawings, sheets/figs _____
☐ the sequence listing *(specify)*: _____
☐ any table(s) related to the sequence listing *(specify)*: _____

* *If item 4 applies, some or all of those sheets may be marked "superseded."*

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/SE 2004/000034

Box No. V **Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Claims	1-12	YES
	Claims		NO
Inventive step (IS)	Claims	1-12	YES
	Claims		NO
Industrial applicability (IA)	Claims	1-12	YES
	Claims		NO

2. Citations and explanations (Rule 70.7)

Amended claims 1-12 were filed on 21 April 2005.

Documents that have been considered as being of particular relevance:
D1 US 5455211 A1
D2 US 6242132 B1
D3 US 4304602 A1

The invention relates to a nitride glass and its preparation. One object of the invention is to obtain a glass with a high refractive index and good hardness values, which is achieved with a glass as defined by the claims.

None of documents D1-D3 reveal the glass defined by the claims or its method of manufacture. D1 (example 10) disclose a glass with some constituents in common with the invention. However, the glass disclosed by D1 contains other elements, like lithium and phosphorus, which results in a glass with different properties than the glass according to the invention. The glass according to the invention differs from the glass revealed by document D2 for similar reasons. Consequently, the glass according to the invention is considered to be novel in regard to the cited documents.

The stated differences imply improvements in achieving improved mechanical properties on an object as for example eye-glasses. The invention as defined by the claims is considered to involve an inventive step and also to fulfil the criteria of industrial applicability.

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/SE 2004/000034

Box No. VII Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

The independent claims are not divided into a preamble and a characterizing portion (PCT Rule 6.3 (b)).

Claims

1. A nitride glass with the general formula $\alpha_x\beta_y\gamma_z$, wherein
α is at least one electropositive element chosen from the group of alkali metals Na, K and Rb, alkaline earth metals Be, Mg, Ca, Sr and Ba, transition metals Zr, Hf, Nb, Ta, W, Mo, Cr, Fe, Co, Ni, Zn, Sc, Y, Mn and La, main group elements Pb, Bi, and f elements Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Th, Pa and U;
β comprises Si and optionally at least one of the elements of the group of B, Ge, Ga and Al; and
γ is N or N together with O, whereby the atomic ratio of O:N is in the interval from 65:35 to 0:100.

2. A nitride glass according to claim 1, **characterised** in that α is chosen from the group of Lu, Mg, Y, Sc, Nd, Gd, Eu, Er, Tb, Tm, Dy, Yb, Th, Pa, Ca, Sr, Ba, La, Pr, Ce, Sm, Mn and Ho.

3. A nitride glass according to claims 1-2, **characterised** in that α is chosen from the group of Ca, Sr, Ba, La, Pr, Ce, Sm, Mn and Ho.

4. A nitride glass according to anyone of claims 1-3, **characterised** in that the ratio α:β is in the interval from 30:70 to 60:40, preferably in the interval from 41:59 to 60:40.

5. A nitride glass according to anyone of claims 1-4, **characterised** in that the ratio β:γ is in the interval from 33:67 to 22:78.

6. A nitride glass according to anyone of claims 1-5, **characterised** in that β is Si.

7. A nitride glass according to anyone of claims 1-6, **characterised** in that the hardness value for the glass is above 5 Gpa, preferably above 9.9 Gpa, and most preferably above 12.3 Gpa.

8. A nitride glass according to anyone of claims 1-7, **characterised** in that the refractivity index of the glass is above 1.4, preferably above 1.9, and most preferably above 2.2.

9. A nitride glass according to claim 1, **characterised** in that the glass possesses magnetic and/or magnetooptic properties and in that α contains at least one element chosen from the group of Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Pa U and Mn.

10. A method for preparing a nitride glass according to anyone of claims 1-9, comprising the steps of

a) mixing chemicals corresponding to the desired composition by using α as a pure metal and/or the corresponding metal nitrides or metal hydrides or any other compound that transforms to the corresponding nitride in nitrogen atmosphere during the synthesis;

b) heating said compounds to at least 1000 °C in the presence of nitrogen gas, thereby obtaining a melt;

c) maintaining the temperature of step b) until the mixed chemical compounds have formed a homogenous melt; and

d) cooling the melt to a temperature below the glass transition temperature and using a cooling rate, that is sufficient in order to obtain a glass phase.

11. A method according to claim 10, **characterised** in that the temperature in steps b) and c) is above 1500 °C, and preferably above 1800 °C.

12. A nitride glass with the general formula $\alpha_x\beta_y\gamma_z$, wherein

α is at least one electropositive element chosen from the group of alkali metals Na, K and Rb, alkaline earth metals Be, Mg, Ca, Sr and Ba, transition metals Zr, Hf, Nb, Ta, W, Mo, Cr, Fe, Co, Ni, Zn, Sc, Y, and La, main group elements Pb, Bi, and f elements Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Th, Pa and U;

β is chosen from at least one of the elements of the group comprising Si, B, Ge, Ga and Al; and

γ is N or N together with O, whereby the atomic ratio of O:N is in the interval from 65:35 to 0:100,

characterized by that the nitride glass is prepared by a method comprising the steps of:

a) mixing chemicals corresponding to the desired composition by using α as a pure metal and/or the corresponding metal nitrides or metal hydrides or any other compound that transforms to the corresponding nitride in nitrogen atmosphere during the synthesis;

b) heating said compounds to at least 1000 °C, preferably above 1500 °C, and more preferably above 1800 °C, in the presence of nitrogen gas, thereby obtaining a melt;

c) maintaining the temperature of step b) until the mixed chemical compounds have formed a homogenous melt; and

d) cooling the melt to a temperature below the glass transition temperature and using a cooling rate, that is sufficient in order to obtain a glass phase.